IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of)
)
Fred E. Barnes, et al.)
)
Application No.: 09/942,913)
)
Filed: August 31, 2001)
)
For: Aviation Gasoline Containing Reduced Amounts of Tetraethyl Lead)
)

Group Art Unit: 1714

Examiner: Toomer, Cephia D.

Confirmation No.: 8128

DECLARATION UNDER 37 C.F.R. § 1.132

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

I, David A. Kohler, declare as follows:

1. I received a B.A. degree in Chemistry from Macalester College, St. Paul, MN, in 1967 and an M.S. degree in Chemistry from University of Washington, Seattle, WA, in 1969. From 1969 – 1972, I was employed by the U.S. Army Materiel Command at the White Sands Missile Range in New Mexico performing chemical analysis of rocket fuels. I received a Ph.D. degree in Chemistry from University of Washington, Seattle, WA, in 1976.

2. I am employed as a Consulting Scientist in Fuels Technology at Chevron Products Company. I have been employed by ChevronTexaco Corporation for 27 years.

3. At Chevron Products Company, I have worked for 16 years on projects related to the composition, quality and performance of gasoline. During that time, my principal analytical chemistry discipline has been the detailed hydrocarbon analysis (DHA) by high resolution

capillary gas chromatography (GC) of gasoline and refinery process streams intended for gasoline blending. In particular, I have concentrated on using our GC DHA capabilities for the exhaustive identification and comparison of alkylates from across the Chevron system. The purpose of my research has been to understand the detailed changes in hydrocarbon distribution resulting from each refinery's unique choice of alkylation feed streams and process conditions.

4. I am an inventor or coinventor of United States Patent No. 5,478,365 and U.S. Patent Publication No. 20020068842 A1. I am familiar with the above-referenced patent application, U.S. Application Serial No. 09/942,913; however, I am not a coinventor on this application.

5. I hereby submit that Appendix I contains a GC DHA analysis of a light alkylate product of an alkylation unit in an oil refinery using H_2SO_4 as a catalyst. This analysis was performed in accordance with my research at Chevron Products Company. Table I below summarizes Appendix I, detailing the percentage of triptane and 2,2,3-trimethylpentane in a light alkylate product of an alkylation unit in an oil refinery using H_2SO_4 as a catalyst.

Table I: Summary Hydrocarbon Analysis of a Light Alkylate Product of an Alkylation Unit Using H_2SO_4 as a Catalyst

Iso-Paraffins						
ID	Vol %	Wt %	Mol %		Name	CAS
22	0.183	0.184	0.188		2,2,3-Trimethylbutane	464-06-2
Alkylate Iso-Paraffins						
ID	Vol %	Wt %	Mol %		Name	CAS
36	1.911	1.990	1.788		223-triMe-pentane	00564-02-3

6. I hereby submit that Appendix II contains a GC DHA analysis of a light alkylate product of an alkylation unit in an oil refinery using hydrogen fluoride as a catalyst. This analysis was performed at Chevron Products Company. Table II below summarizes Appendix II,

detailing the percentage of triptane and 2,2,3-trimethylpentane in a light alkylate product of an alkylation unit in an oil refinery using hydrogen fluoride as a catalyst.

Table II: Summary Hydrocarbon Analysis of a Light Alkylate Product of an Alkylation Unit Using Hydrogen Fluoride as a Catalyst

Iso-Paraffins						
ID	Vol %	Wt %	Mol %		Name	CAS
22	0.069	0.069	0.071		2,2,3-Trimethylbutane	464-06-2
Alkylate Iso-Paraffins						
ID	Vol %	Wt %	Mol %		Name	CAS
36	0.609	0.635	0.572		223-triMe-pentane	00564-02-3

7. As evidenced in the analyses summarized in Tables I and II, triptane and 2,2,3-trimethylpentane are only produced in extremely low levels in an alkylation unit using hydrogen fluoride or H_2SO_4 as a catalyst, for example, in an alkylation unit in an oil refinery.

8. I hereby submit that one skilled in the art readily knows that triptane and 2,2,3-trimethylpentane are produced only in extremely low levels in an alkylation unit using hydrogen fluoride or H_2SO_4 as a catalyst. As evidence of this knowledge, submitted herewith in Appendix III is a copy of Durrett, et al., "Component Analysis of Isoparaffin-Olefin Alkylate by Capillary Gas Chromatography," *Analytical Chemistry*, Vol. 35, No. 6, May 1963, pages 637-640. Durrett, et al. discloses a detailed component analysis of isoparaffin-olefin alkylate through the C_9 range obtained by capillary gas chromatography and a study of the effect of hydrocarbon feed and other process variables on alkylate composition. Table IV of Durrett, et al. contains detailed analyses of the various alkylates produced from pure hydrocarbon feeds by sulfuric acid-catalyzed alkylation. Table III below summarizes Table IV of Durrett, et al., detailing the weight percentage of triptane and 2,2,3-trimethylpentane produced from pure hydrocarbon feeds by sulfuric acid-catalyzed alkylation.

Table III: Effect of Hydrocarbon Feed on Alkylate Composition

	Isobutane +				Isopentane +		
	Iso-butylene	Butene-2[a]	2-Methyl-butene-1	2-Methyl-butene-2	Pentene-2[a]	Iso-butylene	Butene-2[a]
Compound	% Weight, Basis Hexanes-and-Heavier Compounds						
2,2,3-Trimethylbutane	0.19	0.09	0.15	0.17	0.06	0.14	0.05
2,2,3-Trimethylpentane	1.58	2.19	1.33	1.00	0.50	0.13	0.16

[a] A mixture of cis- and trans-isomers.

For purposes of comparison, Table V of Durrett, et al. presents analyses of several commercial alkylates produced by either sulfuric or hydrofluoric acid-catalyzed alkylation. Table IV below summarizes Table V of Durrett, et al., detailing the weight percentage of triptane and 2,2,3-trimethylpentane produced by either sulfuric or hydrofluoric acid-catalyzed alkylation.

Table IV: Comparison of Commercial Sulfuric and Hydrofluoric Acid-Catalyzed Alkylates

	Sulfuric acid			Hydrofluoric acid	
Alkylate sample	A	B	C	D	E
Compound	% Weight, Basis Hexanes-and-Heavier Compounds				
2,2,3-Trimethylbutane	0.17	0.14	0.20	0.04	0.05
2,2,3-Trimethylpentane	1.58	1.23	1.32	1.28	1.07

9. As evidenced by Durrett, et al., I hereby submit that one of skill in the art readily knows that light alkylate, produced in an alkylation unit using hydrogen fluoride or H_2SO_4 as a catalyst, and/or in an oil refinery, contains no to extremely low levels of triptane and 2,2,3-trimethylpentane.

10. I hereby declare that all statements made herein of my own knowledge are true and that all statements made upon information and belief are believed to be true. I understand that willful false statements and the like are punishable by fine or imprisonment, or both under 18 United States Code section 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

David A. Kohler

25 Nov 03

David A. Kohler, Ph.D. Date

Appendix I: Detailed Hydrocarbon Analysis of a Light Alkylate Product of an Alkylation Unit Using H_2SO_4 as a Catalyst

Normal Paraffins						
ID	Vol %	Wt %	Mol %		Name	CAS
4	5.001	4.223	7.459		Butane	00106-97-8
6	0.176	0.160	0.228		Pentane	00109-66-0
Total	5.176	4.384	7.688			
Iso-Paraffins						
ID	Vol %	Wt %	Mol %		Name	CAS
5	0.009	0.008	0.013		2-methylpropane	00075-28-5
7	8.856	7.996	11.377		2-methylbutane	00078-78-4
8	0.004	0.004	0.005		2,2-dimethylpropane	00463-82-1
10	0.960	0.913	1.087		2-methylpentane	00107-83-5
11	0.460	0.445	0.530		3-methylpentane	00096-14-0
12	0.002	0.002	0.003		2,2-dimethylbutane	00075-83-2
13	3.944	3.799	4.526		2,3-dimethylbutane	00079-29-8
16	0.149	0.149	0.153		3-methylhexane	00589-34-4
19	3.511	3.549	3.636		2,3-dimethylpentane	00565-59-3
20	3.658	3.580	3.668		2,4-dimethylpentane	00108-08-7
22	**0.183**	**0.184**	**0.188**		**2,2,3-Trimethylbutane**	**464-06-2**
24	0.263	0.267	0.240		2-Methylheptane	00592-27-8
25	0.044	0.045	0.040		3-methylheptane	00589-81-1
26	0.262	0.269	0.241		4-Methylheptane	00589-53-7
29	2.599	2.691	2.419		2,3-dimethylhexane	00584-94-1
30	2.047	2.086	1.874		2,4-dimethylhexane	00589-43-5
31	3.927	3.961	3.560		2,5-dimethylhexane	00592-13-2
52	0.020	0.021	0.017		2,4-dimethylheptane	02213-23-2
53	0.023	0.023	0.019		2,6-dimethylheptane	01072-05-5
54	0.005	0.006	0.004		2,5-dimethylheptane	02216-30-0
55	0.057	0.060	0.048		3,5-dimethylheptane	00926-82-9
56	0.023	0.024	0.020		2,3-dimethylheptane	03074-71-3
57	0.004	0.005	0.004		3,4-dimethylheptane	00922-28-1
65	0.046	0.049	0.039		3-ethylheptane	15869-80-4
71	0.004	0.004	0.003		3-Me-4-Et-hexane	03074-77-9
85	0.008	0.008	0.006		3-methylnonane	05911-04-6
5001	0.006	0.006	0.004		C-10 Isoparaffin O	NA005-00-1
Total	31.076	30.154	33.725			
Alkylate Iso-Paraffins						
ID	Vol %	Wt %	Mol %		Name	CAS
36	**1.911**	**1.990**	**1.788**		**223-triMe-pentane**	**00564-02-3**
37	33.398	33.609	30.204		224-triMe-pentane	00540-84-1
38	13.444	14.191	12.754		233-triMe-pentane	00560-21-4

39	12.833	13.417	12.057		234-triMe-pentane	00565-75-3
42	1.574	1.632	1.307		225-trimethylhexane	03522-94-9
43	0.179	0.188	0.151		235-trimethylhexane	01069-53-0
51	0.040	0.042	0.034		244-trimethylhexane	16747-30-1
73	0.017	0.017	0.014		224-trimethylhexane	16747-26-5
216	0.001	0.001	0.001		C-11 Isoparaf alky	NA000-21-6
4650	0.003	0.003	0.002		223-triMethylheptane	52896-92-1
4651	0.037	0.039	0.028		224-triMe-heptane	14720-74-2
4652	0.066	0.070	0.050		225-triMe-heptane	20291-95-6
4657	0.020	0.021	0.015		236-triMe-heptane	04032-93-3
4658	0.063	0.067	0.048		244-triMe-heptane	04032-92-2
4659	0.004	0.005	0.003		245-triMe-heptane	20278-84-6
4660	0.009	0.009	0.007		246-triMe-heptane	02613-61-8
4661	0.035	0.037	0.027		255-triMe-heptane	01189-99-7
4690	0.059	0.063	0.041		C-11 Isoparaf Alky A	NA004-69-0
4691	0.002	0.002	0.001		C-11 Isoparaf Alky B	NA004-69-1
4692	0.003	0.003	0.002		C-11 Isoparaf Alky C	NA004-69-2
Total	63.698	65.407	58.535			
Cyclopentanes						
ID	Vol %	Wt %	Mol %		Name	CAS
214	0.006	0.007	0.006		C-9 Naphthenes	NA000-21-4
Total	0.006	0.007	0.006			
Cyclohexanes						
ID	Vol %	Wt %	Mol %		Name	CAS
831	0.002	0.002	0.002		1C3-diMecyclohexane	00638-04-0
946	0.002	0.002	0.002		113-triMecyclohexane	03073-66-3
956	0.011	0.012	0.010		1C3T5-triMeCyhexane	01839-63-0
Total	0.014	0.016	0.013			
Monoolefins						
ID	Vol %	Wt %	Mol %		Name	CAS
303	0.004	0.003	0.006		Cis-2-butene	00590-18-1
304	0.004	0.003	0.006		Trans-2-butene	00624-64-6
Total	0.007	0.006	0.012			
Aromatics						
ID	Vol %	Wt %	Mol %		Name	CAS
601	0.007	0.009	0.010		Toluene	00108-88-3
Total	0.007	0.009	0.010			
Unclassified						
ID	Vol %	Wt %	Mol %		Name	CAS
4071	0.005	0.006	0.004		Unclassified C-10 V	NA004-07-1

4072	0.006	0.006	0.004		Unclassified C-10 U	NA004-07-2
4076	0.005	0.005	0.004		Unclassified C-10	NA004-07-6
Total	0.015	0.017	0.012			

Appendix II: Detailed Hydrocarbon Analysis of a Light Alkylate Product of an Alkylation Unit Using Hydrogen Fluoride as a Catalyst

Normal Paraffins						
ID	Vol %	Wt %	Mol %		Name	CAS
4	2.578	2.182	3.866		Butane	00106-97-8
6	0.249	0.228	0.325		Pentane	00109-66-0
23	0.003	0.003	0.003		Octane	00111-65-9
41	0.004	0.004	0.003		Nonane	00111-84-2
100	0.004	0.004	0.003		Decane	00124-18-5
101	0.002	0.002	0.001		Hendecane	01120-21-4
Total	2.839	2.423	4.200			
Iso-Paraffins						
ID	Vol %	Wt %	Mol %		Name	CAS
5	0.028	0.023	0.041		2-methylpropane	00075-28-5
7	8.565	7.752	11.062		2-methylbutane	00078-78-4
8	0.020	0.017	0.025		2,2-dimethylpropane	00463-82-1
10	0.883	0.842	1.006		2-methylpentane	00107-83-5
11	0.403	0.391	0.467		3-methylpentane	00096-14-0
12	0.004	0.004	0.005		2,2-dimethylbutane	00075-83-2
13	3.092	2.986	3.567		2,3-dimethylbutane	00079-29-8
15	5.116	5.062	5.201		2-methylhexane	00591-76-4
16	0.330	0.331	0.340		3-methylhexane	00589-34-4
18	0.006	0.006	0.006		2,2-dimethylpentane	00590-35-2
19	10.753	10.895	11.195		2,3-dimethylpentane	00565-59-3
20	8.302	8.144	8.368		2,4-dimethylpentane	00108-08-7
21	0.007	0.007	0.007		3,3-Dimethylpentane	562-49-2
22	**0.069**	**0.069**	**0.071**		**2,2,3-Trimethylbutane**	**464-06-2**
24	0.290	0.295	0.266		2-Methylheptane	00592-27-8
25	0.067	0.068	0.062		3-methylheptane	00589-81-1
26	0.256	0.263	0.237		4-Methylheptane	00589-53-7
28	0.005	0.005	0.005		2,2-dimethylhexane	00590-73-8
29	2.836	2.943	2.653		2,3-dimethylhexane	00584-94-1
30	2.956	3.018	2.720		2,4-dimethylhexane	00589-43-5
31	3.131	3.166	2.854		2,5-dimethylhexane	00592-13-2
52	0.055	0.057	0.046		2,4-dimethylheptane	02213-23-2
53	0.034	0.036	0.029		2,6-dimethylheptane	01072-05-5
54	0.005	0.005	0.004		2,5-dimethylheptane	02216-30-0
55	0.095	0.100	0.080		3,5-dimethylheptane	00926-82-9
56	0.051	0.053	0.043		2,3-dimethylheptane	03074-71-3
57	0.006	0.007	0.005		3,4-dimethylheptane	00922-28-1
59	0.003	0.003	0.002		4,4-dimethylheptane	01068-19-5
61	0.020	0.021	0.017		3-methyloctane	02216-33-3
65	0.003	0.003	0.002		3-ethylheptane	15869-80-4
66	0.002	0.002	0.002		4-ethylheptane	02216-32-2

71	0.006	0.007	0.005		3-Me-4-Et-hexane	03074-77-9
85	0.045	0.048	0.035		3-methylnonane	05911-04-6
89	0.007	0.007	0.005		4-ethyloctane	15869-86-0
151	0.006	0.006	0.005		2,2-dimethyloctane	15869-87-1
155	0.006	0.006	0.004		2,6-dimethyloctane	02051-30-1
163	0.002	0.002	0.002		2-methyldecane	06975-98-0
164	0.003	0.003	0.002		3-methyldecane	13151-34-3
215	0.003	0.004	0.002		C-11 Isoparaffins	NA000-21-5
5001	0.023	0.024	0.017		C-10 Isoparaffin O	NA005-00-1
Total	47.494	46.680	50.461			
Alkylate Iso-Paraffins						
ID	Vol %	Wt %	Mol %		Name	CAS
36	**0.609**	**0.635**	**0.572**		**223-triMe-pentane**	**00564-02-3**
37	31.139	31.408	28.308		224-triMe-pentane	00540-84-1
38	5.055	5.348	4.820		233-triMe-pentane	00560-21-4
39	8.994	9.425	8.495		234-triMe-pentane	00565-75-3
42	2.327	2.418	1.941		225-trimethylhexane	03522-94-9
43	0.255	0.268	0.215		235-trimethylhexane	01069-53-0
51	0.055	0.058	0.047		244-trimethylhexane	16747-30-1
73	0.026	0.027	0.022		224-trimethylhexane	16747-26-5
4650	0.008	0.008	0.006		223-triMethylheptane	52896-92-1
4651	0.020	0.021	0.016		224-triMe-heptane	14720-74-2
4652	0.169	0.179	0.129		225-triMe-heptane	20291-95-6
4657	0.057	0.061	0.044		236-triMe-heptane	04032-93-3
4658	0.123	0.131	0.095		244-triMe-heptane	04032-92-2
4659	0.014	0.015	0.011		245-triMe-heptane	20278-84-6
4660	0.027	0.028	0.020		246-triMe-heptane	02613-61-8
4661	0.103	0.111	0.080		255-triMe-heptane	01189-99-7
4663	0.013	0.014	0.010		335-triMe-heptane	07154-80-5
4690	0.220	0.236	0.155		C-11 Isoparaf Alky A	NA004-69-0
4692	0.022	0.024	0.016		C-11 Isoparaf Alky C	NA004-69-2
4693	0.005	0.005	0.003		C-11 Isoparaf Alky D	NA004-69-3
4694	0.013	0.015	0.010		C-11 Isoparaf Alky E	NA004-69-4
4696	0.015	0.017	0.010		C-12 isoparaf Alky A	NA004-69-6
4698	0.035	0.038	0.023		22466pentMe-heptane	13475-82-6
Total	49.304	50.491	45.049			
Cyclopentanes						
ID	Vol %	Wt %	Mol %		Name	CAS
800	0.003	0.003	0.004		Cyclopentane	00287-92-3
Total	0.003	0.003	0.004			
Cyclohexanes						
ID	Vol %	Wt %	Mol %		Name	CAS

825	0.000	0.000	0.000		Cyclohexane	00110-82-7
828	0.006	0.006	0.006		1,1-diMecyclohexane	00590-66-9
831	0.003	0.004	0.003		1C3-diMecyclohexane	00638-04-0
838	0.003	0.003	0.002		iso-Bu-Cyclohexane	01678-98-4
839	0.003	0.003	0.002		sec-Bu-Cyclohexane	07058-01-7
946	0.006	0.006	0.005		113-triMecyclohexane	03073-66-3
Total	0.020	0.023	0.019			
Monoolefins						
ID	Vol %	Wt %	Mol %		Name	CAS
313	0.004	0.004	0.005		Cis-2-hexene	07688-21-3
321	0.004	0.004	0.005		C-3Me-2-pentene	00922-62-3
408	0.008	0.008	0.007		Octenes	NA000-40-8
2039	0.004	0.004	0.004		Cis-2-heptene	NA002-03-9
2040	0.007	0.007	0.008		Trans-2-heptene	14686-13-6
4536	0.002	0.002	0.002		Octene K	NA004-53-6
Total	0.029	0.030	0.032			
Diolefins						
ID	Vol %	Wt %	Mol %		Name	CAS
505	0.008	0.008	0.012		T-1,3-pentadiene	02004-70-8
Total	0.008	0.008	0.012			
Aromatics						
ID	Vol %	Wt %	Mol %		Name	CAS
601	0.002	0.002	0.003		Toluene	00108-88-3
Total	0.002	0.002	0.003			
Unclassified						
ID	Vol %	Wt %	Mol %		Name	CAS
4051	0.008	0.009	0.006		Unclassified C-10 B	NA004-05-1
4052	0.006	0.006	0.005		Unclassified C-10 C	NA004-05-2
4071	0.031	0.033	0.024		Unclassified C-10 V	NA004-07-1
4075	0.038	0.043	0.029		Unclassified C-10 A	NA004-07-5
4078	0.002	0.002	0.002		Unclassified C-10 D	NA004-07-8
4079	0.028	0.031	0.021		Unclassified C-10 E	NA004-07-9
4100	0.004	0.005	0.003		Unclassified C-11 A	NA004-10-0
4102	0.003	0.004	0.002		Unclassified C-11 C	NA004-10-2
4103	0.007	0.008	0.005		Unclassified C-11 D	NA004-10-3
4105	0.008	0.009	0.005		Unclassified C-11 F	NA004-10-5
4109	0.012	0.013	0.008		Unclassified C-11 J	NA004-10-9
4110	0.037	0.043	0.026		Unclassified C-11 K	NA004-11-0
4111	0.010	0.012	0.007		Unclassified C-11 L	NA004-11-1
4114	0.030	0.033	0.022		Unclassified C-11 P	NA004-11-4
4116	0.004	0.004	0.002		Unclassified C-11 R	NA004-11-6

4117	0.009	0.010	0.006		Unclassified C-11 S	NA004-11-7
4118	0.003	0.003	0.002		Unclassified C-11 T	NA004-11-8
4120	0.006	0.006	0.004		Unclassified C-11 V	NA004-12-0
4122	0.004	0.004	0.003		Unclassified C-11 X	NA004-12-2
4125	0.004	0.006	0.003		Unclassified C-11 A	NA004-12-5
4126	0.005	0.006	0.004		Unclassified C-11 B	NA004-12-6
4128	0.002	0.002	0.002		Unclassified C-11 D	NA004-12-8
4129	0.023	0.025	0.015		Unclassified C-11 E	NA004-12-9
4159	0.002	0.003	0.002		Unclassified C-12 T	NA004-15-9
4171	0.011	0.012	0.008		Unclassified C-12 AG	NA004-17-1
4172	0.005	0.006	0.004		Unclassified C-12 AH	NA004-17-2
4173	0.002	0.002	0.001		Unclassified C-12 AI	NA004-17-3
Total	0.301	0.340	0.220			